Health Mobilization Series F-3

Central Sterile Supply Section of the Packaged Disaster Hospital

U.S. DEPARTMENT OF
HEALTH, EDUCATION,
AND WELFARE
Public Health Service

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INTRODUCTION

The Packaged Disaster Hospital

Under normal conditions, almost everyone in the United States has immediate access to adequate hospital facilities. When a major disaster strikes, however, this situation changes radically. Frequently there is an immediate shortage of hospital space, caused by damaged buildings coupled with an overload of patients, at the very time hospitals are most needed to care for the victims.

In the event of a massive nuclear attack, it is estimated that up to 80 percent of our hospital beds could be destroyed, or become inaccessible because of radioactive fallout. The unprecedented need for hospital space in such a national emergency could be met only by expanding surviving accessible hospitals and by establishing emergency medical facilities as soon as radiation levels permit. The Packaged Disaster Hospital (PDH) is designed for these purposes.

The PDH is a unit of sufficient medical supplies and equipment for a complete general medical and surgical hospital to care for the seriously sick and injured following a major disaster. These units, assembled by the Public Health Service and packed for long-term storage, are stored in strategically selected communities across the country to augment their medical facilities in time of major disaster. Current preparedness programming requires the PDH's to be operationally affiliated with a permanent hospital. The PDH can be used to expand the parent hospital or can be set up as a separate 200-bed hospital in an appropriate preselected building to operate in affiliation with the parent hospital.

Communities storing a PDH are responsible for the predisaster plans and arrangements that must be made in order to use the unit following a disaster. Key personnel of community hospitals should assist in the predisaster planning and training and accept responsibility for directing the operation of the PDH in time of disaster.

A comprehensive discussion of the set-up and operation of the PDH is contained in the PHS Publication No. 1071–F–1, *Establishing the Packaged Disaster Hospital.*

PDH Training

It is essential that persons who one day may be called upon to help staff of PDH be trained in setting up and operating the unit and that they become familiar with the supplies and equipment.

Although the PDH provides essentials for a completely functional hospital, its contents are necessarily limited to supplies and equipment which are basic to life-saving medical care and daily hospital operation. The Federal Government provides special units of PDH equipment and supplies for predisaster training of PDH personnel. There are available through State health departments.

The Series 62000 PDH contains an estimated 30-day supply of expendable items. Series 53000–57000 PDH's, originally outfitted to operate for a shorter period, are being expanded with supply additions to bring them up to this 30-day standard. Because it is impossible to predict when supplies will be available postattack from sources outside the community, PDH planning must assume that resupply will come from local sources.

Reusable Supplies

While such items as needles, syringes, surgical gloves, catheters, etc. are available in disposable form, postdisaster conditions preclude the use of disposable items in a PDH. They are considered impractical because of overall procurement costs, the marked increased storage requirements, and the potential postattack resupply problems.

Disposable supplies were developed for normal hospital operation. In selecting PDH supplies the assumption had to be made that resupply of expended disposable materials may not be possible for many months following an enemy attack because of destroyed stocks and an immediate halt in manufacturing. The increased use of disposable items in modern hospitals and the resulting decrease in inventory levels of reusable items further complicates the postattack resupply problems. Accordingly, the PDH is stocked with reusable supplies wherever practical, assuring their availability for an extended period of time.

Supply Sections

Three functional sections of the PDH are concerned with supplies—central sterile supply, general stores and pharmacy.

Central sterile supply is concerned with the cleaning, assembling, sterilizing, storing and dispensing of sterile supplies. If the PDH is used to

expand an existing hospital, the permanent hospital's regular sterile supply may be used, making it unnecessary to set up a separate PDH section for these functions. The PDH equipment and supplies will then be used to augment those of the permanent hospital. When the PDH is used as a separate and complete hospital affiliated with an existing hospital the central sterile supply is set up as a functional section under the administration of the chief of staff.

General stores is the section devoted to the storing and dispensing of nonsterile supplies. It may be established as an independent section under the supervision and management of the hospital administrator and his staff, or it may be operated in conjunction with either the pharmacy section or the central sterile supply section. A comprehensive discussion of this section is covered in the PHS Publication No. 1071–F–17, *General Stores Section of the Packaged Disaster Hospital.*

This manual is intended as a guide in setting up and operating central sterile supply as a separate functional section.

ORGANIZATION OF THE CENTRAL STERILE SUPPLY SECTION

When the PDH is activated, high priority must be given to setting up the central sterile supply section. Surgery cannot be performed until sterile supplies are available and there will be immediate need for these in other treatment sections. Also, it may take longer to set up this section than some others because of the time involved in handling large quantities and varieties of supplies and putting the sterilization equipment into operation. Therefore, central sterile supply must be set up as soon as the PDH arrives at the operating site.

Efficient operation of the section is vital because it provides essential support to all treatment areas as long as the hospital is in operation. The following sections will be serviced by the central sterile supply section: operating rooms, wards, clinical laboratory, and pharmacy. Such materials as dressings, needles and syringes, rubber gloves, catheters, tubing, glassware, instruments, treatment trays and sets, utensils and sterile linens will be stored, processed and issued from central sterile supply.

A. BASIC PLAN

Because central sterile supply cannot operate without a supply of water, the section should be set up in an area which has a sink with running water. It is suggested that the section be divided into two subsections: preparation and sterilization.

1. Preparation Subsection

This subsection must have a water supply, so it should be set up in the area with the sink. Items to be sterilized are received, sorted, cleaned, assembled, inspected, wrapped and labeled for sterilization here. On request from surgery, packs, trays and sets are also made up and labeled in this subsection.

2. Sterilization Subsection

In this subsection assembled packs and individual items are sterilized, stored and issued as needed to the areas of the hospital requesting them. Pressure sterilizers are furnished in the 62000 Series PDH. In the 53000–57000 Series PDH's both pressure and boiling water sterilizers are supplied. While other sections of the PDH may also operate boiling water sterilizers, the bulk of all sterilizing will be done in this area.

3. Personnel

Central sterile supply, like other PDH sections, will operate initially on two 12-hour shifts. The following staff of 11 is suggested for each shift: a central sterile supply chief, a preparation subsection supervisor, a sterilization subsection supervisor, 5 trained aides and 3 helpers. The section chief and, if possible, the two supervisors should participate in the predisaster PDH planning. (Staff qualifications and responsibilities are covered in Chapter 2.)

B. FACILITIES

1. Work Area

An area of approximately 700 square feet is required for the central sterile supply section. Figure 1 (p. 8) is a suggested layout for this section. If more than one room is used, they should be adjacent to each other. If one room is used, it should have two entrances so that one can be used for receiving soiled and contaminated materials into the preparation subsection and the other can be used for issuing sterile supplies from the sterilization subsection.

Because open flame burners are used in the section, it should be located at least 150 feet from the operating rooms to reduce explosion hazards from anesthesia gases.

If possible, the central sterile supply section should be located near general stores because all clean linens will be stored there and central sterile supply frequently will requisition linens to sterilize for use in the operating rooms.

If the operating site of the PDH is in a school building which has a home economics room, this is a good location for central sterile supply because it is equipped with sinks, stoves, counter work space, cabinets and drawers. The counter space will eliminate the need for some of the tables listed in Section 4, Furnishings, and the cabinets and drawers will provide excellent storage space for the preparation subsection.

2. Storage Space

The preparation subsection needs storage space for cleaned supplies and instruments. Most of the instruments in the PDH are coated with oil or other preservatives to protect them during long-term storage. These will have to be cleaned, but not sterilized, as soon as the section is set up. When the hospital is in operation, soiled instruments will be cleaned promptly and stored until requisitions for sterile items are received. Then the cleaned items will be taken to the sterilization subsection.

The sterilization subsection needs only table space for sterile storage. The PDH has a limited inventory of instruments and supplies, which means that sterilization will be done for actual, rather than possible, use. Permanent hospitals, on the other hand, have large inventories and can store quantities of sterile packs, sets and trays for as long as 28 days in anticipation of possible use. In the PDH the physician in charge of assigning priorities to surgical patients will provide the central sterile supply chief with surgery schedules as far in advance as the situation permits. Packs, trays and sets will be made up and sterilized according to these schedules.

When the section is set up in an area without storage cabinets, storage space can be improvised by arranging PDH boxes in layers along one wall; in the center of the room, if it is large enough; or, a nearby storage closet can be used, if available.

3. Environment

Good ventilation is essential in this section. The gasoline burners will cause some fumes and when the large free-standing sterilizer in the 62000 Series PDH is used with a gasoline burner it must have a piece of stove pipe to vent the fumes from the equipment through a window. It is very desirable that the room, or rooms, used for central sterile supply have more than one window.

The same high degree of cleanliness that is maintained in the operating rooms should be the standard for the central sterile supply section. A thorough daily cleaning of all table tops, sink and other work areas is essential, along with the proper maintenance of all mechanical equipment used in the processing of supplies. Cleaning service provided by the housekeeping personnel must be diligently supervised. All such routine cleaning should be performed at a time when it will least conflict with the work of the section's personnel.

In the continuing battle against microorganisms, the primary problems are created by people rather than supplies. The central sterile supply personnel have an obligation to maintain a high standard of personal hygiene and to exercise continuous care in handling contaminated materials for the safety of the patients and the personnel.

The furniture for the central sterile supply section must be obtained locally. If sufficient tables are not available, they can be improvised with PDH packing boxes and crates. A table with casters, if available, will reduce handling in the preparation subsection. The subsections should have the following furnishings:

a. Preparation Subsection
   Sink with running water
   2 cleaning tables near sink
   2 cleaned equipment tables
   4 preparation tables
   4 supply tables for items awaiting cleaning and wrapping

b. Sterilization Subsection
   5 tables for pressure sterilizers
   3 tables for boiling water sterilizers

NOTE: ***The 62000 Series PDH requires only one table, rather than the eight listed above because there is one large free-standing sterilizer and only one table model in this PDH.***

C. INITIAL DISTRIBUTION OF SUPPLIES AND EQUIPMENT TO THE SECTION

The sterilizing equipment and supplies for the central sterile supply section, and all PDH equipment and supplies which require sterilization before use in other sections, should be delivered to central sterile supply when the PDH is moved to the operating site.

PDH supplies and equipment are shown in PHS Publication No. 1071–F–15, *Illustrated Catalog and Guide for the Distribution of Packaged Disaster Hospital Materials.* Persons activating a 62000 Series PDH will find this publication especially helpful because it lists the delivery points for all 62000 Series boxes and creates by number.

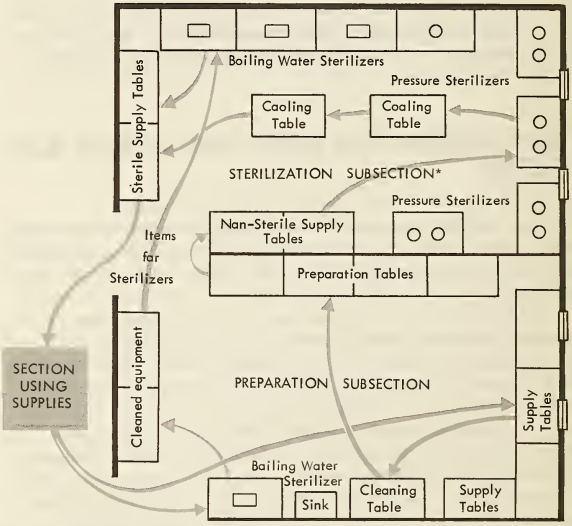
To reduce long-term storage space requirements, some unrelated PDH supplies are packed in the same box. For instance, a box of laboratory equipment may contain one or more items intended for general stores; a box of surgical supplies, which will be delivered to central sterile supply for sterilization before use, may have a few items which are intended for ward use without sterilization. During the activation of the PDH the hospital administrative staff should provide for the immediate pick-up of these miscellaneous items from each PDH section and delivery of them to the proper sections.

D. FLOW OF SUPPLIES AND EQUIPMENT WITHIN THE SECTION (Fig. 1)

1. Preparation Subsection

Supplies to be cleaned are placed on the *cleaning tables* near the sink. These items are thoroughly cleaned, scrubbing with detergents or solvents, and dried.

The cleaned supplies are placed on the *cleaned equipment tables.* From there the cleaned supplies are moved either directly to the sterilization subsection *nonsterile supply tables,* or to the preparation tables to be assembled into packs and wrapped. Wrapped packs are placed on the *nonsterile supply tables* in the sterilization subsection.



* When using horizontal pressure steam sterilizers only one table is needed for sterilization equipment. The larger sterilizer stands on floor.

Figure 1
Suggested Layout for Central Sterile Supply Section

All treatment sections of the hospital must return promptly to central sterile supply all reusable items for sterilization after each use. These items will be routed through the preparation area in the above manner before sterilization.

2. Sterilization Subsection

Figure 1 shows the sterilization subsection set up with portable pressure sterilizers and boiling water sterilizers, equipment provided in the 53000–57000 Series PDH's. The 62000 Series PDH replaces these sterilizers with two pressure sterilizers, one table model and a free-standing horizontal model.

Individual cleaned supplies which are not wrapped in packs are taken from the *cleaned equipment tables* in the preparation subsection to the boiling water sterilizers, or to the 62000 Series table model sterilizer. Wrapped packs are taken from the *nonsterile supply tables* to the portable pressure sterilizers, or to the 62000 Series large horizontal sterilizer.

The subsection supervisor directs the sterilization of supplies and coordinates the use of the sterilizers for individual items and packs as the situation requires.

After sterilization, wrapped packs and dressing drums are placed on the *cooling table* until dry. Tables with metal tops, if available, will permit greater air circulation for the dressing drums. Dry sterile supplies should be stored on the *sterile supply table* until requisitioned.

E. ORDERING SUPPLIES AND EQUIPMENT WITHIN THE PDH

It is advisable that any section of the hospital needing sterile supplies and equipment send a requisition for them to the central sterile supply section. A similar procedure should be set up for ordering supplies from the general stores section and the pharmacy.

Printed requisition forms are not furnished with the PDH because their use is optional. Pads of unruled paper, which can be used for requisitioning supplies, are furnished. If a community decides to use a requisition form similar to the sample shown in Figure 2, a quantity should be obtained locally predisaster and stored with the PDH.

Requisitions should be made out in triplicate. A carbon copy should be retained by the section ordering supplies and the original requisition and second carbon copy should be forwarded to the supply section. The original is retained by the supply section and the carbon copy is returned with the supplies.

If the supplies are not available, the requisition is returned to the originating section. The requisition should indicate that the section may either reorder at a specified time or that the supplies in question are not available at all.

Packages of carbon paper are furnished with the 62000 Series PDH. Communities having other Series PDH's should obtain carbon paper locally and store it, or obtain used carbon from the receiving and sorting section when the hospital is in operation. Triplicate carbon interleafed index cards are furnished for that section and after the cards are filled out the carbon papers can be used by other sections.

DISASTER HOSPITAL
SUPPLY REQUEST FORM

FROM_____SECTION

Date_____

Time_____

ROOM_____

TO: (check one) ☐ STERILE SUPPLY ☐ PHARMACY ☐ STORES

QUANTITY	ITEM NEEDED	IDENTIFYING NO.

DISPOSITION OF REQUEST:
☐ ISSUED ☐ NOT AVAILABLE ☐ OUT OF STOCK
REORDER _____

INSTRUCTIONS: Prepare in triplicate. Send two copies to Sterile Supply, Pharmacy or Stores. Retain one copy.

Figure 2
Disaster Hospital Supply Request Form

STAFFING

A. CENTRAL STERILE SUPPLY CHIEF

The section chief will oversee the activation of central sterile supply and directs its operation. The chief should be a professional nurse, or a practical nurse experienced in surgical and sterilization techniques. In some instances, a hospital pharmacist, dental hygienist or dental assistant experienced in central sterile supply techniques may be assigned to this position.

The chief is responsible to the hospital chief of staff for the management of central sterile supply, including the scheduling of preparation and sterilization of supplies for treatment areas, for organizing and coordinating all activities, and for directing the subsection supervisors.

1. Activation Duties

a. Organizes the arrangement of the subsections, including furniture and equipment, as soon as the PDH is moved to the operating site.

b. Assigns the subsection supervisors and other personnel to their respective areas of responsibility.

c. Supervises the uncrating, sorting, setting up and storage of all equipment and supplies.

d. Directs the setting up and activation of the sterilizers and stoves.

2. Operation Duties

a. Delegates supervisory responsibility to the subsection supervisors and directs work assignments.

b. Coordinates and supervises the selection of instruments for packs, trays and sets.

c. Directs the preparation and sterilization of all instruments and supplies.

d. Schedules the preparation of supplies for the operating rooms, using the schedule of operations received from the physician responsible for assigning priorities to surgical patients.

e. Establishes priorities for the distribution of supplies to treatment sections upon receipt of requisitions.

f. Supervises the maintenance of the central sterile supply section to ensure that a high degree of cleanliness is sustained.

g. Reports on the situation in central sterile supply to the hospital administrator and requests additional personnel as needed.

B. PREPARATION SUBSECTION SUPERVISOR

The supervisor of the preparation subsection should be a professional nurse or a practical nurse with a knowledge of sterile supply techniques. A trained aide with the same knowledge may be used in this capacity to free a nurse to work in another section.

The preparation supervisor works under the direction of the central sterile supply chief in directing the activities of this subsection. The supervisor is responsible for the management of the preparation area, including the direction of assigned personnel, and ensures that all supplies and instruments to be sterilized are properly cleaned and prepared in packs as necessary.

1. Activation Duties

a. Supervises the arrangement of the preparation subsection, as directed by the section chief, as soon as the PDH is activated.

b. Assigns duties to the subsection personnel and supervises the setting up.

2. Operation Duties

a. Under the direction of the section chief, coordinates and supervises the selection of instruments for packs, trays and sets.

b. Directs the cleaning, sorting, wrapping and labeling.

c. Ensures that instruments and supplies are properly cleaned and prepared for sterilization in accordance with scheduling received from the section chief.

d. Reports on the management of the subsection to the section chief.

C. STERILIZATION SUBSECTION SUPERVISOR

The sterilization supervisor should be a practical nurse or a trained aide skilled in sterilization techniques. The supervisor will be responsible, under the direction of the central sterile supply chief, for the management of the subsection, including proper operation of the sterilizers and stoves, and the direction of assigned personnel.

1. Activation Duties

a. Supervises the arrangement of the preparation subsection, as directed by the section chief, as soon as the PDH is moved to the operating site.

b. Oversees the assembling and setting up of the pressure and boiling water sterilizers and stoves.

NOTE: ***If the large free-standing sterilizer in the 62000 Series PDH is run by electricity rather than gasoline, only a professional electrician or medical equipment technician is qualied to wire the unit.***

c. Assigns duties to the sterilization personnel and fuels stoves for immediate operation.

2. Operation Duties

a. Under the direction of the section chief, supervises operation of sterilizers and sterilization of supplies and instruments.

b. Establishes and coordinates priorities for sterilization of packs and supplies as required.

c. Keeps time records on sterilizing supplies in accordance with scheduling received from central sterile supply chief.

d. Distributes sterile supplies upon receipt of requisitions from treatment areas.

e. Oversees the storage of sterile supplies.

D. PREPARATION SUBSECTION STAFF

The suggested initial staffing pattern for this subsection calls for three trained aides and one helper. The aides should be familiar with cleaning instruments and should know how to prepare packs. The helper does not need to have any technical knowledge or training.

During the activation of the preparation area all personnel will assist in unpacking and arranging the supplies and equipment under the direction of the supervisor.

When the preparation subsection is in operation the aides will clean instruments and supplies and wrap and label packs. The helper will assist in activities as assigned and directed by the supervisor.

E. STERILIZATION SUBSECTION STAFF

During the initial operation two trained aides and two helpers can be expected to handle the work of this subsection. The aides should understand the operation and maintenance of the sterilizers and stoves. The helpers do not need to have any technical knowledge or training.

The aides will operate the sterilizers and stoves, store sterilized items and packs, and dispense them on receipt of requisitions. The helpers will assist as assigned and directed by the supervisors.

NOTE: ***All personnel assigned to the central sterile supply section should be instructed in the operation of pressure and boiling water sterilizers and stoves.***

PREPARATION FOR STERILIZATION

A. CLEANING

1. Materials for Cleaning

The following materials for cleaning instruments and supplies will be needed on the cleaning tables; those not furnished in the PDH will have to be obtained locally and stocked during the PDH utilization planning period.

Furnished with PDH	*Obtain locally for 53000–57000 Series PDH's*
Paper towels	Detergent
Surgeon's brush	Glove dusting powder
Gauze	
Detergent (62000 Series only)	
Glove powder (62000 Series only)	

NOTE: ***Materials not delivered to central sterile supply will be requisitioned from general stores.***

Huck towels are furnished in PDH's. Some should be requisitioned for the preparation subsection. Cloth toweling by the yard, which can be used by the preparation subsection in place of huck towels, is available in the 62000 Series PDH.

2. Cleaning Instruments

After Unpacking

Because the PDH has been packed for long-term storage, many instruments are coated with oil or other preservatives. Before these instruments can be sterilized this coating must be removed. When the instruments are delivered to central sterile supply they will be placed on the *cleaning tables.*

The coating can be removed by washing the instruments in hot water at 149° to 180° F., or by scrubbing in warm water with detergent. Nonflammable and nontoxic commercial solvents, such as trichloroethylene, may be used to clean instruments. Solvent, however, must be thoroughly washed off instruments before they are sterilized. Flammable commercial solvents must *never* be used.

After Use

NOTE: ***There is always the possibility that people cleaning instruments may nick their skins; breaks in the skin can be easily infected by contaminated instruments. As a precautionary measure, soiled instruments from surgery should be boiled before cleaning. This preliminary boiling will reduce the hazard of infection from bacteriologically contaminated instruments. In the 53000–57000 Series PDH's one of the boiling water sterilizers should be in the receiving area of the preparation subsection for this purpose. In a 62000 Series PDH a one-burner alcohol stove and pan for boiling water can be used for this purpose.***

All instruments should be processed promptly after use. If this has not been possible, and soil and blood have dried, they should be soaked. The following steps are taken to process soiled instruments.

a. Rinse with cold water.

b. If necessary, soak in warm water and detergent at 125°F.

c. Boil soiled instruments from surgery in water for 20 minutes.

d. Wash with detergent and warm water. Use a hand brush to scrub all exposed parts, hinges, stopcocks and other crevices.

e. Rinse with hot tap water.

f. Dry with a towel while the instruments are still hot. Unless the instruments are thoroughly dried they will rust, corrode, or be spotted with water marks.

g. Place on *cleaned equipment table* or *preparation table.*

3. Cleaning Needles

Used needles, like instruments, should be sterilized prior to cleaning to reduce the hazard of infection from bacteriological contaminations.

a. Rinse in cold water.

b. Presterilize by boiling for 20 minutes.

c. Remove and soak in cool water and rinse.

d. Thoroughly flush with warm water and detergent. Clean hub with an applicator.

e. Rinse by flushing with three separate rinses. *Some moisture must be present in the needles if they are to be sterilized by steam.*

f. Place on *cleaned equipment table* or *preparation table.*

4. Cleaning Syringes

a. Disassemble syringes and soak in cool tap water.

b. Wash separate parts thoroughly with warm water and detergent.

c. Rinse several times with tap water.

d. Match the barrels and plungers by serial numbers and hold the parts together by rolling a piece of gauze between and around them. Syringes in the PDH are *not* multifit types. The two parts of the syringe, the barrel and plunger, have the same serial number marked on each part. *These must be matched or the syringe cannot be used.*

e. Place on the *cleaned equipment* or *preparation table.*

5. Cleaning Rubber Gloves

Handle gloves very carefully to avoid tearing or puncturing.

a. Wash first in cold water to remove blood.

b. Wash in warm water and detergent.

c. Rinse thoroughly three times.

d. Check gloves carefully for tears or puncture holes by filling gloves with air and observing whether there is any leakage. Damaged gloves cannot be used for sterile procedures. Set aside damaged gloves to be used for other purposes.

e. When speed is essential dry gloves inside and out with a towel. Be sure all parts are thoroughly dry. When there is time, it is preferable to hang gloves to dry.

f. As soon as they are dry, powder the gloves inside and out. Powder one side, turn inside out and powder.

g. Place them on the *preparation table.*

6. Cleaning Rubber Supplies

Rubber goods must be scrubbed thoroughly. All surfaces of rubber goods should be moist when sterilized. Clean such supplies as catheters, tubing and drains in the following manner.

a. Soak for two hours in warm water and detergent.

b. Flush interior thoroughly with clean water several times.

c. Wash thoroughly in warm water and detergent.

d. Rinse thoroughly three times. *Do not dry.*

7. Cleaning Utensils

This category includes bedpans, urinals, basins, pitchers, etc. Stainless steel should be washed, rinsed and dried as soon as possible. Aluminum is best cleaned with mild soap or detergent, using a stroke that follows the grain of the surface.

a. Soak, if necessary.

b. Wash thoroughly in warm water and detergent.

c. Rinse in hot water.

d. Dry thoroughly.

e. Place on *cleaned equipment table* or *preparation table.*

8. Cleaning Flasks

a. Remove caps and collars before washing flasks.

b. Wash flasks, collars and caps in warm water and detergent.

c. Rinse thoroughly three times in clean water, drain.

d. Inspect for cleanliness and cracks.

e. Place on *cleaned equipment table* or *preparation table.*

B. ASSEMBLING

Cleaned articles are inspected, sorted and wrapped before sterilization. In general, items which do not need to be wrapped are placed on the *cleaned equipment tables*, others will be placed on the *preparation tables.*

1. Inspection and Sorting

All cleaned articles are inspected for cleanliness and working condition. Any items found unclean will go back to the cleaning table. Put aside any that are in poor working condition to be discarded or repaired.

Items are sorted categorically and by size and type so that like items can be sterilized together.

2. Assembling Packs, Trays and Sets

Materials for basic packs, trays and sets will be assembled for wrapping. A discussion of these groups and suggested lists of materials for basic trays and sets is given on page 46.

3. Folding Linens

Sterile linens for operating rooms including sheets, drapes, towels, pillow cases and gowns, will be processed in central sterile supply. When these items are requisitioned, central sterile supply will obtain them from the clean linen supplies in general stores. The operating rooms will requisition masks and caps, which do not need to be sterilized, directly from general stores.

Linens must be folded before being wrapped in packs so that they can be unfolded without danger of contaminating the sterile surfaces. The following instructions for folding allow the linens to be unfolded by touching only the corners.

a. Sheets (Fig. 3)

Fold sheets in half with the hems together; then fold twice more in the same direction, leaving the hems on the outside. This procedure will make a strip as long as the sheet width and about 12 inches wide. With the hems on the outside, fold the strip in halves in the opposite direction until it measures about 12 inches by 13 inches.

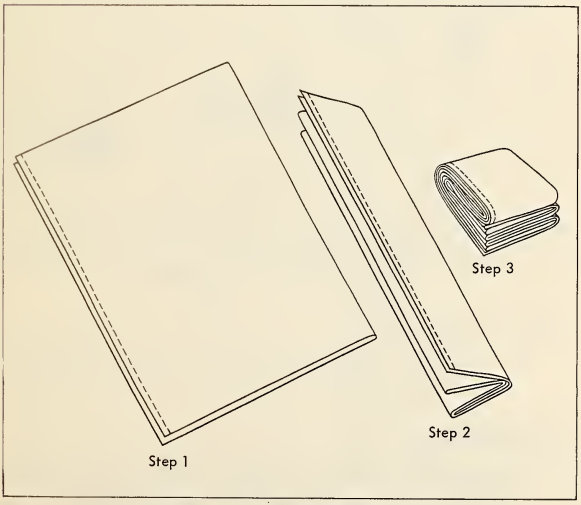


Figure 3. Folding Sheet for Sterilization

b. *Drapes (Cut-out and hole drapes)*

Fold drapes in half lengthwise; starting with the fold, fold in thirds. Keeping the stitched edges on the outside, fold this long strip in halves until it measures 12 inches by 12 inches.

c. *Hand Towels and Pillow Cases (Fig. 4)*

Hand towels and pillow cases should first be fan-folded lengthwise in thirds, making a long narrow strip. Fan-fold this strip into three to four inch folds.

When the pillow case is to be used to cover an instrument stand, turn back the open end to form a three-inch cuff. Then fan-fold the case crosswise until a three-inch strip is made. Fold the strip in half with the cuff on the outside.

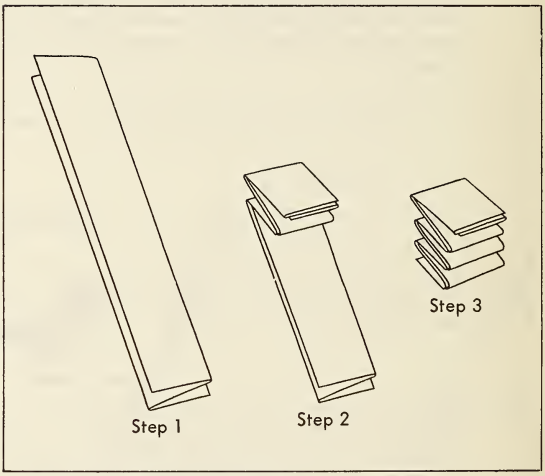


Figure 4. Folding Towels or Pillow Cases for Sterilization

d. *Gowns (Fig. 5)*

Hold the gown by the inside center of the neck and fold back, inside out, in thirds. The sleeves will now be folded inside. Fold in half; fold again in half with the inside of the neck up.

Figure 5
Folding Surgical Gown for Sterilization

C. WRAPPING

1. Materials for Wrapping

Individual items and basic packs, sets and trays will be wrapped at the preparation tables. The following materials will be needed there; those which are not furnished with the PDH must be obtained locally.

Furnished with PDH

18″ and 36″ square cloth wrappers
Paper towels
Pencils
Brush, surgeon's
Gauze
Heavy brown paper (62000 Series only)
Twine (62000 Series only)
Shipping tags (62000 Series only)

Obtain locally for 53000–57000 Series

Heavy brown paper
Twine
Shipping tags

Obtain for all PDH's (Optional)

Pressure sensitive sterilizing tape
Chemical sterilizer indicators

Packs are fastened with twine and their contents are recorded on the tags. After the packs are sterilized they are dated in the sterilization subsection. Pressure sensitive tape is preferable to twine and tags because, in addition to sealing the packs more effectively, it changes color under sterilization and indicates that the packs have received favorable temperature, steam pressure and exposure time.

Chemical sterilizer indicators inserted in the center of large packs detect air pockets which impede sterilization. These controls come in pellet and cardboard strip forms. The pellet sealed in a glass tube melts when the sterilizing time and temperature are favorable. The cardboard strip impregnated with dye changes color under favorable steam pressure.

Tapes and controls should be used with all sterilizers, if possible. Since these items are not supplied in PDH's, PDH readiness planners should consider obtaining them locally. If a community decides to use these optional items, they should be obtained in large quantity because the tape and controls can be used only once.

2. General Procedures (Fig. 6)

If there are too few cloth wrappers available to handle the work load, wrapping can be done in a single thickness of heavy brown paper. The wrapping procedures are the same as those given below for cloth wrappers.

a. Select the proper size double thickness cloth wrapper for the items to be wrapped and lay it flat on the table. Center the articles on the wrapper.

b. Pick up a corner of the wrapper and bring it across the articles. The corner of this first fold should be turned back on itself slightly so that the package can be opened by unsterile hands without contaminating the inside of the wrapper or the articles.

c. The two adjacent corners are then folded over. The pack should now look like an unsealed envelope.

d. Pull the fourth corner of the wrapper over the previous folds and tuck in.

e. Tie the pack with string, do not draw it tight.

f. Write the contents of the pack on the shipping tag and tie it securely to the pack.

If the pressure sensitive sterilizing tape is used instead of string: turn under about ½-inch at one end of a strip of tape to form a tab which makes it easier to remove the tape from the pack after sterilizing. Fasten the pack securely, making the packs snug but not tight. Tuck in any loose ends. Record the contents on the tape.

3. Wrapping Instruments

a. Protect all cutting edges with gauze or paper before wrapping.

b. Open all jointed instruments before wrapping.

c. Select and assemble instruments for trays and sets (see Chapter 4).

4. Wrapping Needles and Syringes

a. These items are wrapped separately.

b. Be sure that matching parts of each syringe are held together with gauze before wrapping. Do not insert the plunger in the barrel.

c. When needles are to be sterilized by steam, *stylets should be packaged with, not in, the needle.*

5. Wrapping Rubber Drains

Soft, flat drains should not be folded when packaged because the steam must circulate through them.

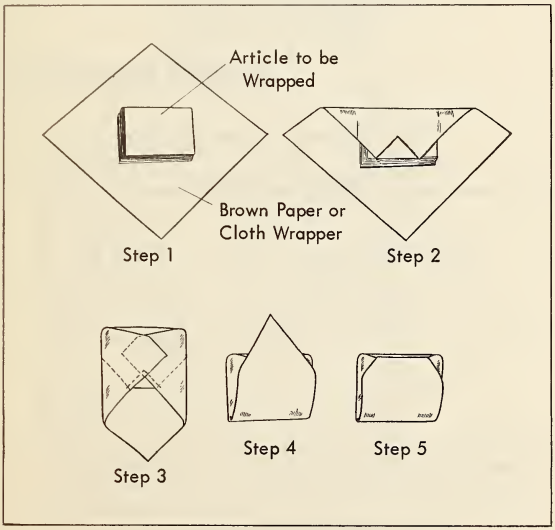


Figure 6. Wrapping articles in Brown Paper or Cloth Squares

6. Wrapping Gloves

a. Turn cuffs down about two or three inches.

b. Place a strip of paper toweling in each glove.

c. Lay a piece of paper toweling, three sheets long, flat on the table and place a pair of gloves in the center about one inch apart, right glove on the right (Fig. 7).

d. Fold each end of toweling over gloves so the ends meet in the center.

e. Fold again, one glove over the other. Be sure that gloves do not slip out of place and overlap. Each glove must be covered with the paper toweling.

f. Tie with a piece of string or sterilizing tape and record glove size.

g. Place six packets of gloves (six pairs) on a cloth wrapper and wrap, recording glove size on shipping tag or outside tape.

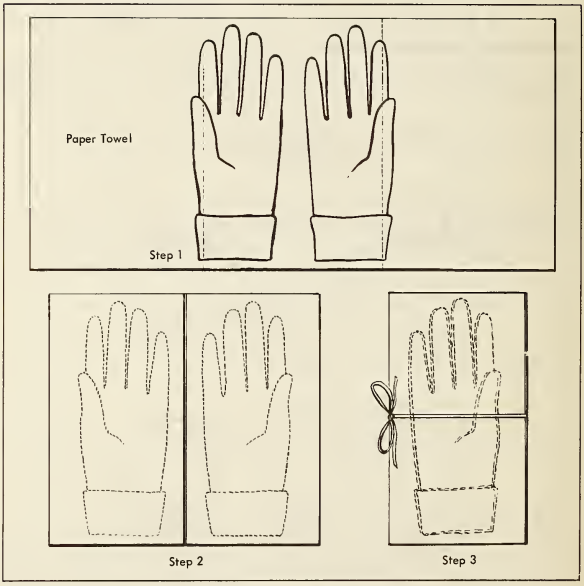


Figure 7. Wrapping Gloves for Sterilization

STERILIZATION

A. TIMER CONTROL SHEET

In the 62000 Series PDH the two sterilizers work automatically or with a handset timer. However, there are no timers on the sterilizers in the 53000–57000 Series PDH's. Therefore, it is essential that a Timer Control Sheet be kept on each sterilizer. This sheet should show the types of items being sterilized, required sterilization time, the time sterilization begins, scheduled time for completion and the actual completion time. Since this record may be valuable to the central sterile supply chief, a Timer Control Sheet is also recommended for the 62000 Series PDH.

A special Timer Control Sheet form can be printed locally, or the information can be recorded on writing pads supplied with the PDH, depending on the decision of the PDH utilization planners.

B. STERILIZATION EQUIPMENT

The following equipment is furnished in the PDH:

53000–57000 Series

9 pressure cooker sterilizers with liquified petroleum (LP or bottled gas) stoves

6 open boiling water sterilizers with gasoline-fueled stoves

62000 Series

One table model 8″ x 16″ steam pressure sterilizer, operated by electricity, solidified hydrocarbon fuel (canned heat), or gasoline saturated ceramic blocks

One free-standing 16″ x 36″ steam pressure sterilizer, operated by electricity, gasoline burner, or direct steam.

Instructions for using this equipment follows. Detailed assembly instructions for sterilizers and stoves are given in the PHS Publication No. 1071–F–14, *Assembling Equipment in the Packaged Disaster Hospital.*

C. STERILIZATION BY STEAM PRESSURE

Saturated steam under pressure is the most reliable method of sterilization and the one most frequently used in modern hospitals. It is the most dependable method because of the ability of steam to penetrate and to destroy microorganisms, including spores.

The 3-minute flash type of sterilization under steam pressure—used in many hospital operating suites—can be used to advantage in a PDH to service a heavy surgery schedule with the somewhat limited PDH supply of instruments. When the temperature reaches 270° F., unwrapped instruments and utensils can be sterilized in three minutes. Both sterilizers in the 62000 Series PDH can be used in this manner, but the portable models in the 53000–62000 Series cannot.

The presence of air in the steam chamber will impede positive sterilization and the gauges and thermometers will not always indicate air pockets. If small amounts of air remain in the chamber, they will concentrate in pockets in the load where they are difficult to remove. Any mixture of air and steam also will lower the temperature in the chamber.

1. Portable Sterilizer (Fig. 8)

This unit has the following components and accessories (Fig. 9):

40-quart Sterilizer

Aluminum container to hold packs or a dressing drum

Perforated metal rack

Kit of spare parts and paraffin stick

Instructions for operating sterilizer and stove

An LP gas stove, packed separately, is used with this unit

27 Dressing Drums, to be used with this unit, are included in the 54000–57000 PDH supplies to be delivered to central sterile supply.

Important Precautions:

Do not overload sterilizers with too large packs or packs too tightly packed.

Pack sterilizers loosely to allow free access of steam and escape of air.

Do not shorten exposure time because of a rush order.

Clean outlet screen and exhaust line regularly.

Follow all maintenance instructions carefully.

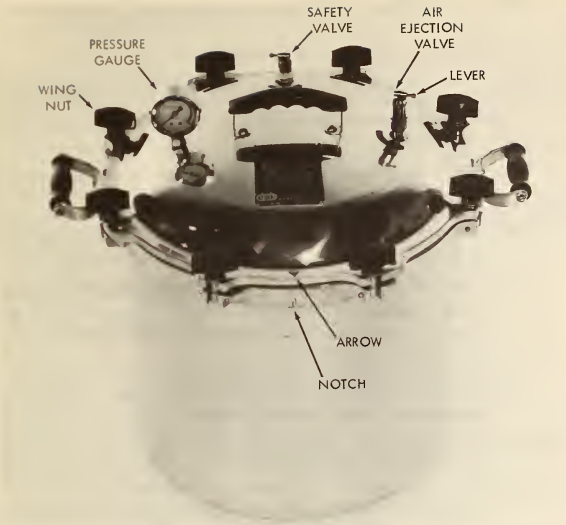


Figure 8. Portable Sterilizer

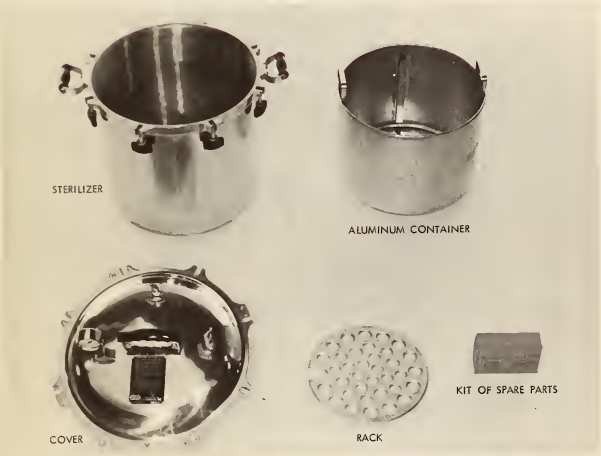


Figure 9. Components and Accessories of Portable Sterilizer

a. Filling the sterilizer

(1) Pour one quart of water in sterilizer.

(2) Set metal rack on the bottom of the aluminum container

(3) Place packs, or dressing drum containing packs, in the container (see Section c. pg. 29)

(4) Place container in sterilizer, making certain that the vertical channel in the container is on the right.

(5) Soften paraffin stick and run it around outer edge of sterilizer to insure a tight seal when the sterilizer is heated.

(6) With arrow and gauges on the lid facing front (air-ejector valve attached to flexible hose on right), place the lid on the sterilizer, threading hose through vertical channel on container as the lid is lowered.

(7) To seal, tighten any two opposite wing nuts. Tighten the other pairs until all are firmly secured.

The sterilizer rests directly on the LP gas stove.

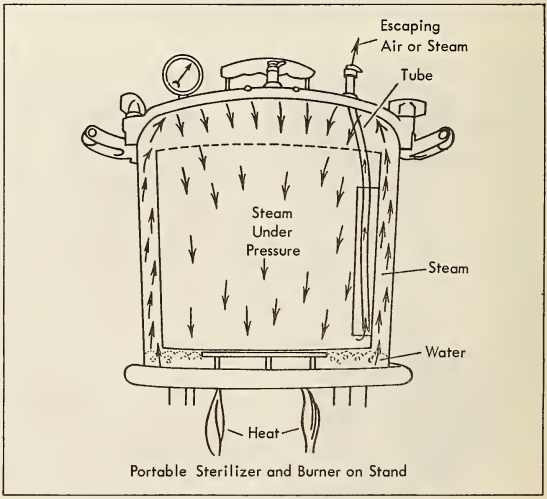


Figure 10. Schematic Diagram of Sterilization Operation

b. How the sterilizer operates (Fig. 10)

The portable unit sterilizes with high pressure steam (15 pounds per square inch). The boiling water in the bottom of the sterilizer produces steam which rises to the top around the outside of the aluminum container. When it can rise no further it is forced down inside the container. As the steam moves down it pushes the air in the sterilizer ahead of it. The air escapes from the bottom of the container through the flexible hose which is connected inside the cover to the air ejector valve. After all the air is pushed out of the sterilizer the steam escapes. All the air in the sterilizer must be replaced with steam or sterilization may be complete. When there is a steady flow of steam from the air ejector valve, and the temperature and steam pressure reach the required levels, sterilization begins.

c. Placing packs in sterilizer (Fig. 11)

Packs can be placed directly on the rack in the container, or in a dressing drum. The dressing drum is convenient for carrying and storing a quantity of sterilized packs. The drums should be used whenever possible because packs can be left in them to dry, whereas the sterilizer container must be reused immediately for the next load to be sterilized.

The circular dressing drums have hinged tops and a double perforated band around the outside wall. This band slides to permit the holes to be covered after sterilization and drying when sterile packs are to be stored in the drums.

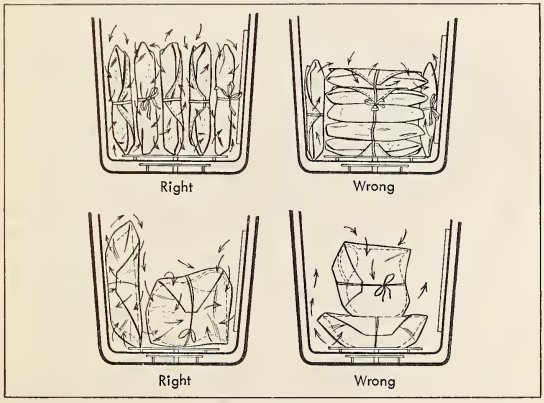


Figure 11. Placement of Packs in Sterilizers

Important points to remember when packing container or drum:

(1) Do not place packs tightly against bottom and sides of container or drum.

(2) Stand all packs on end and be sure they rest on the rack and not on bottom of container.

(3) Packs of folded linens should be placed with the open fold toward the bottom of the sterilizer to permit the steam to circulate freely between the folds and penetrate the packs.

(4) A wrapped basin should be placed vertically in the container and a wrapped pitcher on its side.

(5) When a dressing drum is used, be sure the holes are open.

d. Operating stove and sterilizer

(1) Assemble LP gas stove (Fig. 12) according to instructions with stove, or as outlined in PHS Publication No. 1071–F–14, *Assembling Equipment in the Packaged Disaster Hospital.*

(2) The stove comes with the gas valve adjusted for LP gas, so if this type of gas is used, the gas supply line is attached directly to the valve.

NOTE: ***Neither an LP gas supply nor supply lines are stocked with the PDH. These items must be obtained locally. Caution: Copper tubing or high pressure flexible tubing must be used with LP gas.***

(3) The stove is lit and operated like a kitchen gas stove. Instructions for using the stove with LP gas, or adapting it for other types of gas are provided with each stove.

(4) Place the sterilizer on the stove before lighting it. Position the pressure gauge so the operator can read it easily.

(5) See that the safety and ejector valves on the sterilizer cover are screwed on tightly, and that the valve levers are in horizontal position during the entire sterilization period (except for solutions which are discussed in (17), page 32).

(6) When the pressure gauge needle moves into the green field and a steady stream of steam flows from the ejector valve, sterilization begins. *Start timing at this point.*

(7) Record starting time on Timer Control Sheet, along with type of load, required sterilization time, and time scheduled for completion.

(8) Continue sterilization for the time prescribed. Adjust the burner, if necessary, to maintain a slow but constant stream of steam from the ejector valve. If the pressure gauge needle starts climbing rapidly, turn the flame down. If the pressure should rise too high, steam will be released through the safety valve.

(9) If, for no apparent reason, the pressure in the sterilizer drops rapidly, and there has been considerable leakage of steam around the sterilizer cover, turn the burner off immediately. *Raise the ejector valve lever and wait for the pressure to drop to zero.* Remove cover and check to see if water has boiled away. If so, wait until the sterilizer has cooled, refill with water and start the sterilization procedure again, making sure to follow operating directions.

(10) When the sterilization period is completed, turn off the burner and raise the ejector valve lever to release the steam.

(11) Record sterilization completion time.

(12) When the pressure drops to zero, completely loosen the knobs on the cover, but leave the cover in position. Leave the cover on for at least 15 minutes so that the heat in the sterilizer can assist in drying the sterilized packs.

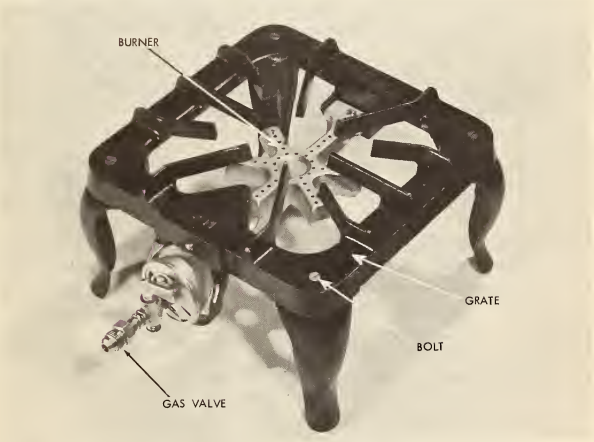


Figure 12. Liquid Petroleum Gas Stove

(13) When the packs are sufficiently dry, remove the cover and take out the packs or dressing drum. Leather or cloth gloves, not supplied with the PDH, will help protect the hands while handling hot drums.

(14) Caution should be exercised when the packs are removed from the container or drum because the packs can be contaminated easily by placing them on wet surfaces. Packs should be left in the drums until completely dry.

(15) If the packs have to be removed while they are still wet, they must be handled with sterile sponge forceps and placed on a sterile surface (Fig. 13).

(16) Record the date on the shipping tags or sterilizer tape on packs.

(17) *For sterilizing solutions:* Place ejector valve lever in a vertical position before sterilizer is placed on the stove. When a steady stream of steam is escaping, place lever in a horizon-

Figure 13. Removing Pack with Sterile Forceps

tal position. Watch the pressure gauge to *be sure it does not go beyond the 250° F. point*, which is the beginning of the green field. Reduce the flame and maintain pressure at this point for the required sterilization period. When sterilization period is over, remove the sterilizer from the stove and allow the pressure to drop slowly to zero. Remove cover and take out solutions. Do not raise the ejector lever for solutions when there is still pressure indicated on gauge or solutions will be boiled out of their containers.

(18) *When reusing sterilizer:* Water must be added to the sterilizer each time it is used to bring the volume to one quart. Wait until the sterilizer has cooled before adding cold water. Apply paraffin to the edge of the sterilizer each time while the sterilizer is still warm.

e. *Maintenance of sterilizer and stove*

Follow the instruction sheet accompanying the stove for maintenance procedures. Detailed instructions for maintenance of sterilizer are also included with unit. Be sure to take the following precautions.

(1) Empty the water from the sterilizer and dry thoroughly when unit is not in use.

(2) Clean when necessary with soap and water. Never use soda, lye or alkali. Be careful not to immerse the gauge or control valves in water.

(3) Never put cold water into the sterilizer when it is very hot and dry and never place the unit on a cold floor. Sudden change in temperature may crack the aluminum.

(4) If the pressure gauge is damaged, replace it with the spare gauge included in the unit. Two spare knobs for bolting down the cover are also included.

(5) If steam should escape through the safety valve before it flows through the ejector valve, it may mean that the safety valve has not been properly adjusted. Find the spring inside the safety valve and stretch it until it is ¼-inch longer.

The safety valve should operate automatically at a pressure of 25-27 pounds per square inch to release the steam pressure. After adjusting the safety valve observe the operation carefully and if for any reason this pressure is exceeded, (1) immediately extinguish the flame and (2) manually operate the safety valve to reduce the pressure. Then have the valve repaired.

2. Small Horizontal Steam Pressure Sterilizer

This 8″ x 8″ x 16″ sterilizer (Fig. 14) can be operated electrically, with solidified hydrocarbon fuel, or with ceramic blocks saturated with gasoline.

The unit components and accessories (Fig. 15) are:
Solidified hydrocarbon fuel — 306 cans supplied
2 Ceramic blocks (fire bricks)
Combustion cup to hold can of solidified fuel
Asbestos lined combustion cup for ceramic block
Stove for solidified fuel or ceramic block
2 Trays for instruments or dressings
Electrical cable cord equipped with adapters which may be used with either double or triple prong outlet.

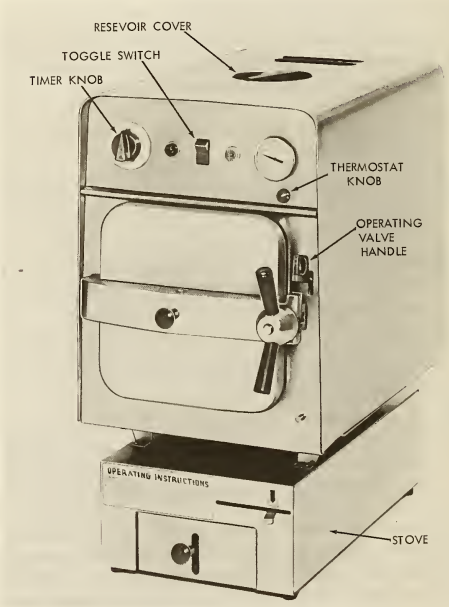


Figure 14. Small Horizontal Pressure Steam Sterilizer

As noted earlier, this equipment can be used for 3-minute flash sterilization. The supervisor may want to use it exclusively for this purpose when operating room schedules are heavy and use the large free-standing autoclave for all other sterilizing.

Figure 15. Components and Accessories of Small Horizontal Pressure Steam Sterilizer

Recommended Minimum Exposure Periods for Steam Sterilization*

ITEM	MINUTES AT 250°-254°F.	MINUTES AT 270°F.
Instruments		
Metal only	15	3
Metal combined with other materials	15	7
Metal in covered tray	15	7
Metal and other materials in covered tray	20	10
Wrapped in packs	20	10
Dressings		
Wrapped	30	10
In open canisters (on sides)	30	10
Utensils		
Unwrapped	15	3
Wrapped	20	10
Rubber Goods		
Gloves, wrapped	20	
Catheters, Drain, Tubing, wrapped	20	
Catheters, Drains, Tubing, unwrapped	20	10
Flasked Solutions		
75–250 ml	20	
500–1000 ml	30	
1500–2000 ml	45	
Needles, individually packed in glass tubes or paper	30	10
Syringes, wrapped	30	10
Treatment Trays, wrapped	30	10
Sutures, wrapped	30	10
Linen packs	30	
Glassware, inverted	15	3

* Prepared by The Educational and Research Department of American Sterilizer Company, Erie, Pa.

a. Operating electrically

This unit requires an outlet with power at 110–120 volts, 60-cycles, A.C. The operating steps are:

(1) Turn the time knob to the OFF position. Raise operating valve to maximum height. Turn the thermostat knob fully counterclockwise.

(2) Connect electrical outlet.

(3) Fill the water reservoir with approximately three quarts of water. Use distilled or demineralized water, if available. Remove reservoir cover (do not attempt to detach chain) and fill to about ½-inch below the opening. Replace cover.

(4) Open sterilizer door and remove trays so water level indicator in chamber can be seen. Push operating valve handle down. When water reaches level indicator, pull operating valve handle up. The water should barely touch the bottom of the word "Level".

(5) Load sterilizer.
Instruments: Place a layer of muslin or a towel in the bottom of tray and place the instruments on it. Cover the instruments with a sterile towel to prevent contamination after the tray is removed and in transit.
Small packs: Place on edge in tray, never flat, to permit circulation of steam.
Utensils and empty glassware: Whether wrapped or not, place them on their sides or inverted in tray.
Record type of load and required sterilization time on Time Sheet.

(6) Close and lock sterilizer door and push operating valve handle down until it rests on the door locking bar.

(7) Turn thermostat knob clockwise to desired temperature setting.

(8) Snap toggle switch to STER position.

(9) Set timer for *preheat cycle,* (approximately 20 minutes). Red and white pilot lights will glow. Red indicates that power is on and white indicates that heaters are on. A bell will ring when the cycle is completed.

(10) When the temperature reaches the thermostat setting the white light will go off. Thermometer will now register the desired temperature. If it does not, reset the timer for additional preheating.

(11) When the thermometer registers desired temperature, set timer for the exposure time desired. Record time sterilization begins and scheduled time for completion. A bell will signal the end of the sterilization period and the timer cuts off the electric power. Record actual completion time.

(12) Pull the operating valve handle to the maximum height to exhaust the steam and residual water in the chamber back to the reservoir. When the thermometer registers 212° F. or less, open the door about ¼-inch to hasten drying.

(13) If drying cycle is required, snap toggle switch to DRY position. Set timer for desired drying time (10-15 minutes). Both red and white pilot lights will glow. When the bell indicates the completion of the drying time, open the door. Let the sterilizer cool for 10 minutes, remove the load and reuse. Before reusing be sure to fill the reservoir to level as before.

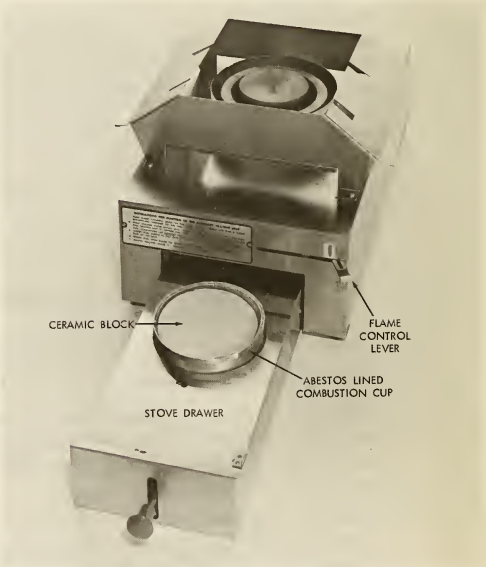


Figure 16. Small Pressure Steam Sterilizer Stove with Cermic Block Fuel

b. Operating with stove (Fig. 16)

If for some reason it is not possible or desirable to operate the sterilizer electrically, it can be used with the stove and solidified heat or ceramic blocks. The sterilizer operation, given above, will be the same when the stove is used.

With solidified heat or ceramic block

(1) Unscrew bottom of sterilizer, which will expose rods.

(2) Insert the second and third rods into the slots in the top of the stove.

(3) *For solidified heat only:*
Pull out the stove drawer and insert the *unlined* combustion cup in the holder. Insert can of fuel in the combustion cup.

Alternate (3) *For ceramic block only:*
Insert *asbestos* lined combustion cup in the cup holder of the stove. *Never* use unlined cup with a ceramic block. Out-of-doors, soak unwrapped ceramic block in gasoline 10-12 minutes. Insert saturated block in lined combustion cup.

NOTE: *Exercise usual care when handling gasoline. Do not smoke or work near flame — do not inhale fumes. Be sure gasoline supply is stored away from functioning areas of hospital, out-of-doors.*

(4) Move the flame control lever to the far left. If the sterilizer is to be used immediately, ignite the fuel and close the drawer rapidly. Height of fuel drawer knob may be adjusted to prevent initial sooting and to obtain maximum heat.

NOTE: *If the sterilizer is later operated electrically, it is not necessary to replace the sterilizer bottom cover. The heating unit may serve as a stand.*

3. Large Free-Standing Steam Pressure Sterilizer (Fig. 17)

This unit operates either by electricity (220 or 440 volts, 60-cycle A.C.), by gasoline burner, or by direct steam. When the PDH is used to expand an existing hospital, this sterilizer should be operated on the hospital's direct steam, if available. If the PDH is set up as an independent hospital and the preselected operating site has a direct steam line, it should be used for this sterilizer. When it is operated electrically, the electrical connection must be made by a professional electrician or medical equipment technician. Electrical cable will have to be obtained locally.

NOTE: ***If the PDH is operating on auxiliary power supplied by the PDH generators, this large sterilizer must not be operated electrically. It should be operated electrically only when a local power source is available.***

a. Operating Electrically

(1) After the unit is set up and connected to current, open the sterilizer door. Turn the double handle counterclockwise and pull up on latch handle until door-locking arms are retracted.

(2) Shelves may be arranged in steam chamber as desired by sliding them into the brackets.

(3) Fill with water. Remove the pipe plugs on the tanks, located on either side of the top of the sterilizer. *Open water supply valve.* Turn operating valve to STER position. Using attached funnel, fill tanks until sight glass shows FULL. *Close water supply valve. Turn operating valve to* OFF. Continue filling tanks until they are full. Replace pipe plugs.

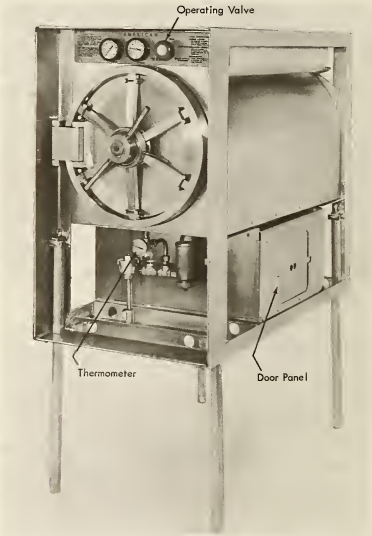


Figure 17. Large Horizontal Pressure Steam Sterilizer

(4) Turn the pressure control switch knob fully clockwise. Turn the heater switch on; the red pilot light will glow. When the pressure gauge shows proper pressure, turn the pressure control switch slowly counterclockwise until the pilot light goes out.

(5) Wait 10-15 minutes for the sterilizer to preheat and allow the pressure to stabilize.

(6) Load the sterilizer.

(7) Close the door; rotate the handle clockwise; tighten the hand-wheel securely.

(8) Turn the operating valve to STER position.

(9) When the thermometer in the chamber drain line shows the desired temperature, sterilization begins. *Start timing at this point.*

(10) At the end of the sterilization period turn the operating valve to FAST EXHAUST for fabric and instruments loads, to SLOW EXHAUST for solution loads.

(11) Do not touch the sterilizer until the chamber pressure gauge shows zero.

(12) If drying cycle is required, turn the operating valve to DRY and open door ¼-inch.

(13) Trun operating valve to OFF and loosen door-locking arms. Cool load for five minutes.

(14) Remove load and date each pack on shipping tag or tape. The sterilizer may be reloaded and recycled immediately.

b. Operating with Gasoline Burner

When the gasoline burner is used it will be necessary to operate the sterilizer with the windows open, or, ideally, with the fumes vented to the outside through a stove pipe attached to the top of the sterilizer. The stove pipe must be obtained locally. *Never operate with gasoline without adequate ventilation. Store gasoline away from functioning sections of the hospital, out-of-doors.*

(1) After the unit has been set up, remove door panel on side of the sterilizer. The gasoline burner unit which comes with the sterilizer is slipped in the opening, drawer fashion.

(2) Take the burner unit outdoors and pour gasoline in the tank on the right. Ignite the burner and adjust the flame while it is still outdoors.* Throttle the flame down and carry the lighted burner inside to the sterilizer.

(3) Pump air into left tank with the pump provided. Follow instructions attached to the unit to achieve air pressure.

(4) Replace door panel. Door may be opened or closed by sliding to right or left.

(5) To vent fumes, open sliding panel on top of sterilizer chamber. Be sure that maximum opening is achieved. Standard stove pipe should be attached to vent opening.

(6) Operating procedures are the same as those given for operating electrically.

c. *Maintenance*

Detailed instructions are included with the unit, along with tools and spare parts. The following must be done daily.

(1) The chamber drain plug screen (in bottom of the drum just inside the door) should be removed and lint and sediment removed from the strainer.

(2) Before heating, the interior surface of the steam chamber, should be cleaned with mild detergent and water. Do *not* use steel wool or abrasive. Clean the shelves in the same manner.

4. Storing Sterilized Items

Sterilized packs and trays should be used as soon as possible. If they are not used immediately, dry sterile packs should be stored in a dry, protected place. In the 62000 Series PDH 24 dressing jars are provided for storing and transporting packs. Sterile supplies are dated immediately after sterilization.

D. STERILIZATION BY BOILING

Boiling water is the simplest method of sterilization and may be used chiefly for sterilizing instruments and utensils when the steam sterilizing facilities are overcrowded. It should also be used in the preparation sub-

* It is characteristic of this burner to smoke profusely when first ignited. This is caused by incomplete combustion of the fuel. The smoke will gradually diminish as the generator pressure increases and the flame becomes bluish green. For this reason, the burner should be ignited and brought up to operating temperature out-of-doors. Ignition in the sterilizer will result in an accumulation of carbon on the heat exchanger which will reduce the sterilizer efficiency to the point that a much longer period of time will be required to attain operating temperatures.

section for sterilizing contaminated instruments and needles before they are cleaned to protect the cleaning personnel.

1. Sterilizing Equipment

The boiling water unit contains the following:
Sterilizer
Tray
Handles for lifting tray
2-burner gasoline stove and stand
Metal wind protector for use out-of-doors or in a draft
Kit of spare parts

The stoves and sterilizers are packed together and the stove is completely assembled.

2. Operating (Fig. 18)

a. Be sure that the stove fuel control valves are closed tightly by turning them to the right. Take the stove outside the building to fill with gasoline. Remove the filler cap and fill the tank. A tube installed inside the opening prevents overfilling. Replace filler cap and tighten firmly by hand.

b. Pull the legs upward from the groove and turn them outward diagonally. The legs form the stand which supports the sterilizer. Place the sterilizer on the stove.

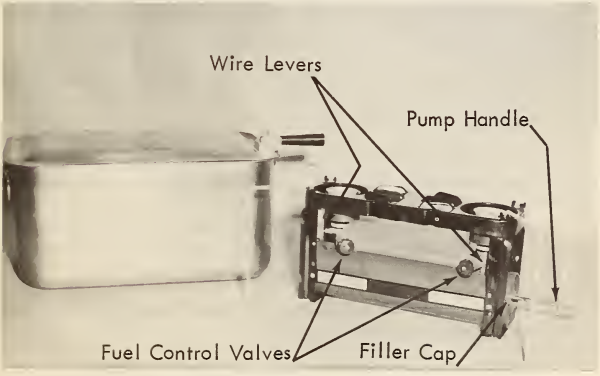


Figure 18. Boiling Water Sterilizer and Stove

c. Fill the sterilizer with three gallons of water or until the water reaches just above the two parallel screws which hold the tray supports.

d. Be sure the fuel control valves on the burner are closed. Unlock the pump by turning it to the left several times. Hold thumb or palm of hand over the vent hole in the end of the pump handle and pump 25 or 30 strokes of air into the tank. Turn pump handle to the right and close tightly.

e. Light each burner head.

(1) Revolve the wire lever on the fuel control valve several times. This cleans the gas tip. Stop lever in DOWN position.

(2) Open the fuel control valve a quarter turn to the left. After a few seconds apply lighted match to top of burner head.

(3) Five minutes or more are required before the flame settles down to a steady blue. After the flame burns a steady blue for two or three minutes, open fuel control valve as far as possible.

f. Pump additional air during the first few minutes to keep up the air pressure. It may be necessary to operate the stove several times to determine accurately the number of strokes of the pump required to maintain proper air pressure. Be sure to turn the pump handle to the right and close it tightly after each pumping.

g. The size of the flame cannot be controlled by the fuel control valve. If the flame is too high, it may be adjusted by turning the wire lever up slightly to reduce the flow of gas. A higher flame can be obtained by increasing air pressure with a few strokes of the pump.

h. When the water in the sterilizer is near the boiling point, fill the tray with items to be sterilized. The items should be completely submerged in the water when the cover of the sterilizer is closed.

i. Time the sterilization period from the time the water boils vigorously and continue for 20 minutes. If it is not practical to submerge the items completely (in the case of basins and large instruments), the period of sterilization should be increased to 30 minutes. The sterilizer should be kept closed and the water boiling vigorously so that the area above the water is filled with flowing steam.

j. Record sterilization information on Timer Control Sheet for each of the boiling water sterilizers.

k. Turn the fuel control valves to the right as far as possible to turn off the stove.

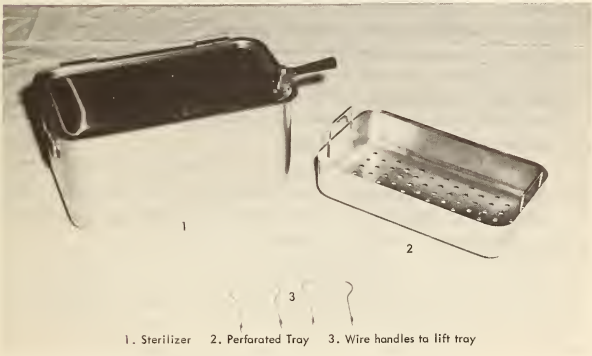
3. Removing Items from Tray

One of the problems of sterilizing by boiling water is the handling of sterile articles when they come out of the boiling water.

a. Most of the boiling water sterilizers in the PDH's are opened by raising the handle to lift the cover. The tray must be removed by using the hand loops furnished with the unit (Fig. 19). Some models in PDH's are opened by pushing the cover handle down which lifts the cover and also raises the instrument tray above the water level. The tray should be allowed to stand until the water drains off and the instruments are dry.

b. Cover a tray with a sterile towel of double thickness. As soon as the instruments are thoroughly dry, place them on the tray, using sterile forceps. Another sterile towel should be used to cover the instruments and tray while it is carried to the *sterile equipment table*, or to the hospital section where the instruments are needed.

c. Sterilized instruments should be stored in central sterile supply for as short a time as possible.



1. Sterilizer 2. Perforated Tray 3. Wire handles to lift tray

Figure 19
Components of Boiling Water Sterilizer

SUGGESTED BASIC PACKS, TRAYS AND SETS

Surgical packs, trays and sets are made up by central sterile supply to meet specific or anticipated hospital requirements. The components vary according to the preferences and requirements of individual hospitals.

The PDH instruments and supplies which are suitable for basic packs, trays and sets are by necessity considerably more limited in variety and quantity than those available in permanent hospitals. Therefore, key hospital personnel charged with the responsibility for staffing and directing the operation of a PDH should become familiar with its equipment.

When a PDH is used to expand an existing hospital, the staff probably can assemble packs, trays and sets in their usual way, using their own hospital's equipment augmented by PDH supplies. When the PDH is set up as a complete hospital, however, the composition of basic packs, trays and sets will have to be modified to conform with the limitations of available PDH equipment. In this case, to save time and avoid misunderstandings when the PDH is activated, the PDH staff should establish, predisaster, some standard lists of items for basic packs, trays and sets based on anticipated disaster needs and PDH equipment.

The following pages suggest the composition of some basic trays using only PDH equipment. The descriptions of the instruments are taken from the PHS Publication No. 1071-F-15, *Illustrated Catalog and Guide for the Distribution of Packaged Disaster Hospital Materials.*

LAPAROTOMY

(Basic Tray)

Quantity	Item
4	Forceps, Towel, Backhaus, 3½″
1	Director and Tongue Tie, 5½″
8	Forceps, Hemostatic, Curved, Kelly, 5½″
6	Forceps, Hemostatic, Straight, Kelly, 5½″
4	Forceps, Hemostatic, Straight, Rochester-Ochsner, 7¼″
6	Forceps, Gauze Pad Holding, Straight, Foerster, 9½″
2	Forceps, Tissue, Tweezers, Straight, 5½″, 1 x 2 teeth
4	Forceps, Tissue, Pivoted, Straight, Allis, 6″ 4 x 5 teeth
1	Holder, Suture Needle, Masson, 10½″
1	Holder, Suture Needle, Hegar-Mayo, 7″
2	Blade, Surgical Knife, Detachable, Large Tang, No. 21
1	Handle, Surgical Knife, Detachable Blade, Wide Nose, No. 4
1	Probe, General Operating, Straight 8″
1	Retractor, Set, Abdominal, Double Ended, Richardson-Eastman, Set of 2
2	Retractor, General Operating, Volkman, 4 Sharp Prongs
1	Scissors, General Surgical, Curved, Mayo, Double Blunt Dissecting, 5½″
1	Scissors, General Surgical, Straight, Mayo, Double Blunt, Dissecting, 5½″

The Laparotomy Tray is a basic tray, as noted, and can be used for Gastrointestinal Resection, Thoracotomy, Skull Fracture and Limb Amputation by adding the appropriate items, listed under these headings below and on the following pages.

A. Gastrointestinal Resection

Quantity	Item
1	Clamp, Intestinal, Anastomosis, Rankin, 3 Blades
1	Forceps, Intestinal, Straight, Babcock, 7¾″
1	Forceps, Tissue, Straight, 7½″
2	Retractor, Abdominal, Balfour, Self-Retaining, 6 Blades

B. Thoracotomy

Quantity	Item
2	Needle, Hypodermic, Aspirating-Pneumothorax, Luer Lock, Regular Bevel, 13 Gage, 3½″, 12s
1	Catheter, Urethral, Rubber, Double Eye, Hollow-Pointed Tip, Robinson, 22 Fr.
1	Catheter, Urethral, Rubber, Double Eye, Hollow-Pointed Tip, Robinson, 20 Fr.
1	Catheter, Urethral, Balloon, Self-Retaining, Double Eye, Wolf Modification of Foley Design, Rubber, Round Tip, with 5 ml Bag, 26 Fr.
1	Catheter, Urethral, Balloon, Self-Retaining, Double Eye, Wolf Modification of Foley Design, Rubber, Round Tip, with 5 ml Bag, 20 Fr.
1	Elevator, Periosteal, Double-Ended, Blunt, Sayre, 6½″
1	Forceps, Bone Cutting, Liston-Stille, 10½″
1	Forceps, Dressing, Straight, Serrated, Rounded Tip, 10″
2	Forceps, Hemostatic, Straight, Kelly, 5½″
1	Retractor, Rib, Finocchieto, Self-Retaining, Fenestrated Blade
1	Syringe, Luer, General Purpose, Small Tip, Glass, Graduated in 1 ml intervals, 20 ml

C. Skull Fracture

Quantity	Item
1	Brace, Bit, Bone, Cranial, Cushing
2	Bur, Cranial, Hudson, 9 mm.
2	Bur, Cranial, Hudson, 16 mm.
1	Elevator, Periosteal, Double-Ended, Blunt, Sayre, 6½″
1	Forceps, Bone Cutting, Liston-Stille, Compound Action, Curved, 10¼″
1	Forceps, Tissue, Tweezers, Adson, 4½″, 1 x 2 Teeth
1	Scissors, Tonsil, Curved, Metzenbaum, Both Points Blunt, 1½″ Cut, 7″
3	Conductor, Bone Cutting Wire Saw, Bailey
1	Handle, Bone Cutting Wire Saw, Gigli
6	Saw, Bone Cutting, Wire, Spiral Teeth, Without Handle 20″
2	Clip, Suture, Michel, 14 mm., 100s (For use with Forceps, Suture Clip)
1	Forceps, Suture Clip, Applying and Removing, Michel

D. Limb Amputation

Quantity	Item
1	Elevator, Periosteal, Double-Ended, Blunt, Sayre, 6½″
1	Forceps, Bone Cutting, Liston-Stille, Compound Action, Curved, 10½″
1	Handle, Surgical Knife, Detachable Blade, Narrow Nose, No. 4
1	Retractor, General Operating, Volkman, 4 Sharp Prongs
1	Saw, Amputating, Satterlee, 8″ Detachable Blade
2	Blade, Surgical Knife, Detachable, Large-Tang, No. 21

TRACHEOTOMY

Quantity	Item
2	Needle, Hypodermic, Luer Lock, Regular Bevel, 22 Gage, 1″, 12s
2	Needle, Hypodermic, Luer Lock, Regular Bevel, 25 Gage, ¼″, 12s
1	Syringe, Luer, Needle Lock, Glass, Graduated in 1/5 ml Intervals, Without Finger Rings, 10 ml
1	Catheter, Urethral, Rubber, Double Eye, Hollow-Pointed Tip, 16 Fr.
1	Catheter, Urethral, Rubber, Double Eye, Hollow-Pointed Tip, 12 Fr.
1	Cannula, Tracheotomy, Metal, Jackson, Size 3
1	Cannula, Tracheotomy, Metal, Jackson, Size 5
1	Cannula, Tracheotomy, Metal, Jackson, Size 7
1	Handle, Surgical Knife, Detachable Blade, Narrow Nose, No. 3
1	Probe, General Operating, Straight, 8″
1	Scissors, General Surgical, Curved, Mayo, Double Blunt, Dissecting, 5½″
2	Bandage, Gauze, Roller, Sterile, 3″ x 10 Yards (Substitute for Cotton Tape)
1	Director and Tongue Tie, 5½″
2	Forceps, Towel, Backhous, 3½″
2	Forceps, Hemostatic, Curved, Rochester-Pean, Mosquito, 6½″
2	Forceps, Hemostatic, Straight, Kelly, 5½″
1	Forceps, Gauze Pad Holding, Straight, Foerster, 90½″
4	Forceps, Tissue, Tweezers, Straight, 5½″ 1 x 2 Teeth
1	Holder, Suture Needle, Hegar-Mayo, 7″
1	Blade, Surgical Knife, Detachable, Small-Tang, No. 11
1	Medicine Glass, Graduated, 1 oz.

OBSTETRICS*

Quantity	Item
1	Catheter, Urethral, Rubber, Double Eye, Hollow-Pointed, 16 Fr.
1	Catheter, Urethral, Rubber, Double Eye, Hollow-Pointed, 12 Fr.
2	Forceps, Towel, Backhaus, 3½″
2	Forceps, Obstetrical, Curved, Simpson, 14″
2	Forceps, Hemostatic, Curved, Kelly. 5½″
1	Forceps, Tissue, Tweezers, Straight, 5½″, 1 x 2 Teeth
1	Holder, Suture Needle, Hegar-Mayo, 7″
1	Scissors, General Surgical, Curved, Mayo, Double Blunt, Dissecting, 5½″
1	Scissors, General Surgical, Straight, Mayo, Double Blunt, Dissecting, 5½″

*Umbilical Tape to be added or improvised.

LACERATION

Quantity	Item
1	Holder, Suture, Needle, Hegar-Mayo, 7″
2	Blade, Surgical Knife, Detachable, Small Tang, No. 11
1	Scissors, General Surgical, Straight, Mayo, Double Blunt, Dissecting, 5½″
3	Forceps, Hemostatic, Curved, Rochester-Pean, Mosquito, 6¼″
3	Forceps, Hemostatic, Straight, Kelly, 5½″
2	Forceps, Hemostatic, Straight, Halstead, Mosquito, 5″
1	Forceps, Gauze Pad Holding, Straight, Foerster, 9½″
2	Forceps, Tissue, Tweezers, Straight, 5½″, 1 x 2 Teeth
2	Forceps, Tissue, Pivoted, Straight, Allis, 6″, 4 x 5 Teeth
1	Holder, Suture Needle, Hegar-Mayo, 7″
2	Director and Tongue Tie, 5½″
4	Forceps, Towel, Backhaus, 3½″
1	Syringe, Luer, General Purpose, Small Tip, Glass, Graduated in 1/5 ml intervals, 10 ml
2	Needle, Hypodermic, Luer Lock, Regular Bevel, 22 Gage, 1″
2	Needle, Hypodermic, Luer Lock, Regular Bevel, 23 Gage, ¾″

SPINAL PUNCTURE

Quantity	Item
3	Test Tube, Glass, Without Lip, Rated Coefficient of Expansion 33 x 10^{-7}, Wasserman, 13 x 100 mm., 12s
1	Medicine Glass, Graduated, 1 oz.
2	Needle, Hypodermic, Luer Lock, Short Bevel, 20 Gage, 1½", 12s
2	Needle, Hypodermic, Leur Lock, Regular Bevel, 23 Gage ¾", 12s
1	Needle Hypodermic, Spinal Puncture, Luer Lock, Short Bevel, With Fitted Stylet, 20 Gage, 3½"
1	Needle, Hypodermic, Spinal Puncture, Luer Lock, Short Bevel, With Fitted Stylet, 22 Gage, 3½"
1	Syringe, Luer, Needle Lock, Glass, Graduated in 1/10 ml Intervals, Without Finger Rings, 2 ml
1	Forceps, Hemostatic, Straight, Kelly, 5½"

GASTRIC GAVAGE-LAVAGE

Quantity	Item
1	Tube, Duodenal, Surgical, Levin, Single Lumen, 16 Fr.
1	Basin, Emesis, CRS, Kidney-Shaped
1	Basin, Wash, Seamless Aluminum, With Rim, 12¼ x 4½"
1	Tube, Stomac, Surgical, 30 Fr.
1	Lubricant, Surgical, Jelly, 4 oz.
1	Medicine Glass, Graduated, 1 oz.
1	Syringe, Glass, Bulb, Rubber, With Removable Tip, 4 oz.

CATHETERIZATION

Quantity	Item
2	Catheter, Urethral, Rubber, Double Eye, Hollow-Pointed Tip, Robinson, 16 Fr. or 18 Fr.
2	Lubricant, Surgical, Jelly, 4 oz.
2	Medicine Glass, Graduated, 1 oz.
2	Bowl, Gauze Pad, CRS, 6¼ x 3⅛"

IRRIGATIONS

Quantity	Item
1	Irrigator, CRS, Without Handle, 2 qt.
1	Nozzle, Rectal Irrigating, Plastic, Adult
1	Nozzle, Vaginal Irrigating, Plastic, Adult
1	Rod, Irrigator Supporting, Single Hook, Telescopic Type
1	Tube, Irrigator, Surgical, Valentine, Rubber, 7 ft.

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